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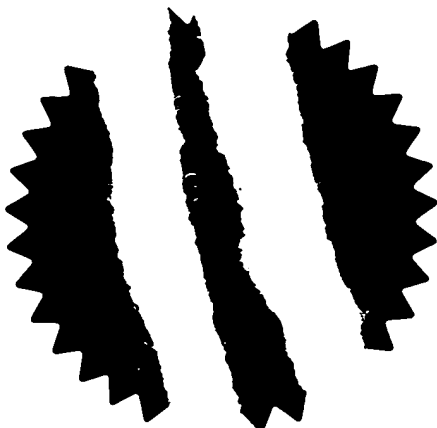
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South Wales
NP10 8QQ

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Dated 16 October 2003

**Statement of inventorship and of
right to grant of a patent**



The Patent Office
Cardiff Road
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Gwent NP9 1RH

1.	Your reference	BP-09-0005	
2.	Patent application number (if you know it)	GB 00 20591.4	
3.	Full name of the or of each applicant	FMC CORPORATION	
4.	Title of the invention	MULTIPLE BORE CHRISTMAS TREE OUTLET	
5.	State how the applicant(s) derived the right from the inventor(s) to be granted a patent	By virtue of an Assignment effective 18 th August 2000 made between 1) the Inventor; 2) his employer, FMC Corporation (UK) Limited; and 3) the Applicants.	
6.	How many, if any, additional Patents Forms 7/77 are attached to this form (see note (c))	-	
7.	<p>I/We believe that the person(s) named over the page (and on any extra copies of this form) is/are the inventor(s) of the invention which the above patent application relates to.</p> <p>Signature <i>Martin Hammler</i> Date 28th November 2000</p>		
8.	Name and daytime telephone number of person to contact in the United Kingdom	Martin Hammler	020 7822 8888

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Enter the full name, address and postcodes of the inventors in the boxes and underline the surnames

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Patents ADP number (if you know it):

7629181001

Patents ADP number (if you know it):

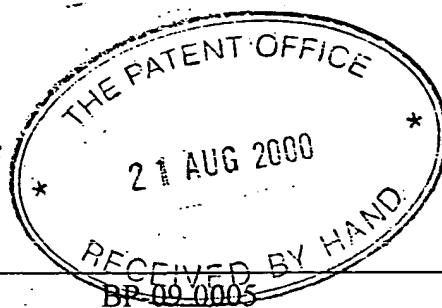
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The Patent Office

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1.	Your reference		
2.	Patent application number (The Patent Office will fill in this part)	0020591.4	
3.	Full name, address and postcode of the or of each applicant (<i>underline all surnames</i>)	FMC CORPORATION 200 East Randolph Drive Chicago Illinois 60601 U.S.A.	
	Patents ADP number (<i>if you know it</i>)	U.S.A. 4315941002	
	If the applicant is a corporate body, give the country/state of its incorporation	U.S.A. / Delaware	
4.	Title of the invention MULTIPLE BORE CHRISTMAS TREE OUTLET		
5.	Name of your agent (<i>if you have one</i>)	PHILLIPS & LEIGH	
	"Address for service" in the United Kingdom to which all correspondence should be sent (<i>including the postcode</i>)	5 Pemberton Row London EC4A 3BA	
	Patents ADP number (<i>if you know it</i>)	1289001	
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7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing (<i>day / month / year</i>)
8.	Is a statement of inventorship and of right to grant of a patent required in support of this request? (<i>Answer 'Yes' if:</i>		
	a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body. See note (d))		
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Patents Form 1/77

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Continuation sheets of this form -

Description 2

Claim(s) 1

Abstract 1

Drawing(s) 1

9
21

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Priority documents -

Translation of priority documents -

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*) To follow

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Request for substantive examination (*Patents Form 10/77*) 1 ✓

Any other documents (please specify) -

11. I/We request the grant of a patent on the basis of this application.

Signature

Martin Hammler

Date

21st August 2000

12. Name and daytime telephone number of person to contact in the United Kingdom Martin Hammler 020 7822 8888

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MULTIPLE BORE CHRISTMAS TREE OUTLET

Field of the Invention

This invention relates to production outlets for large bore Christmas trees.

5

Invention Background

Traditionally, buoyant oil markets have provided the financial justification for the development of, and production from, multiple wells. However, current market circumstances dictate that whilst production volume must be maintained, it must be done
10 with a reduced number of wells. This has led to the development of larger bore production xmas trees.

Problem to be Solved

Large bore production xmas trees, particularly subsea trees utilising horizontal outlets,
15 present problems with outlet diameters. Current outlet valve technology accommodates outlets of up to 7" (178mm) diameter. Any production outlet with a diameter of over 7" (178 mm) will require the development of a new subsea gate valve, with the consequent costs involved, as well as the disadvantages of increased size and weight of the new design.

20

Summary of the Invention

The present invention solves the above problems by enabling the use of existing standard sized outlet valves and actuators in a large bore production tree. To that end, the present invention provides a production Christmas tree having multiple production outlets.
25 Splitting one large production outlet into two or more smaller outlets allows the use of existing subsea gate valves and actuators, with each production outlet being controlled by a separate, standard sized valve, thereby avoiding the cost of development of a new larger subsea gate valve. This system has the further benefit that pressure drops due to reservoir depletion, and associated flow assurance problems, can be alleviated by closing one of the
30 production outlets. Erosion problems are also reduced. Preferably each production outlet has a different diameter. By selecting different outlets or combinations of outlets, a

wide range of production flow rates can be catered for, as the reservoir pressure drops over the lifecycle of the field. In a preferred embodiment, two outlets are provided. These may be for example a 7" (178 mm) and a 5" (127 mm) outlet. However other diameters may be used, for example to suit smaller sized valves.

5

An illustrative embodiment of the invention is described below with reference to the drawings.

Brief Description of the Drawings

- 10 Fig. 1 schematically shows the vertical bore and single horizontal production outlet of a prior art large bore horizontal production tree, and
Fig. 2 schematically shows a dual production outlet horizontal tree embodying the invention.

15 Description of the Preferred Embodiment

The prior art horizontal xmas tree shown in Fig. 1 has a vertical through bore 10 and a single horizontal production outlet 12 branched off from the vertical bore 10. Annular seals 14, 16 surround the vertical bore 10 above and below the production outlet 12, to seal a tubing hanger (not shown) in the vertical bore 10. A gate valve 18 forming a
20 production master valve is situated in the production outlet 18.

In the embodiment of the invention shown in Fig. 2, the horizontal outlet 12 from the production bore is split into two separate outlets 20, 22. The outlet 20 is controlled by a 5" (127 mm) subsea gate valve 24 and actuator. Similarly, the outlet 22 is controlled by
25 a 7" (178 mm) subsea gate valve and actuator.

CLAIMS

1. A production Christmas tree having multiple production outlets.
- 5 2. A production Christmas tree as defined in claim 1, wherein each production outlet has a different diameter.
3. A production Christmas tree as defined in claim 1 or 2, comprising two said production outlets.
- 10 4. A production Christmas tree as defined in claim 3, wherein one of the outlets is of 7" (178 mm) diameter or smaller.
5. A production Christmas tree as defined in claim 4 wherein the other outlet is of 5" 15 (127 mm) diameter or smaller.
6. A production Christmas tree as defined in any preceding claim, being a horizontal tree.
- 20 7. A production Christmas tree having multiple production outlets, substantially as described with reference to or as shown in Fig. 2 of the drawings.

Abstract

[Fig. 2]

MULTIPLE BORE CHRISTMS TREE OUTLET

5

A large bore Christmas tree includes a production outlet 12 that is split into multiple separate outlets 20, 22, each controlled by a separate, standard sized valve and valve actuator 24, 26.

1/1

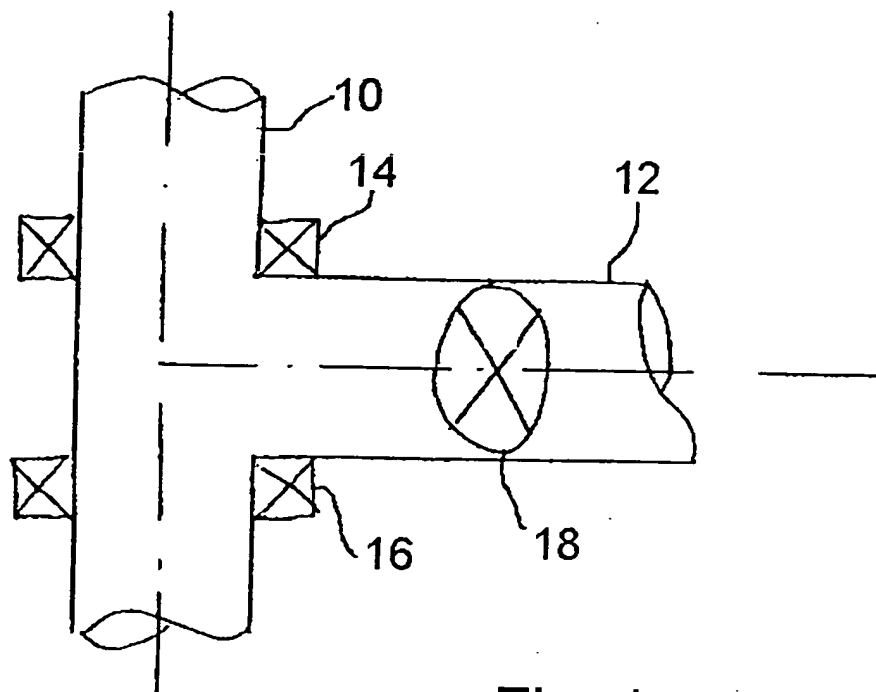


Fig. 1 (prior art)

Fig. 2

